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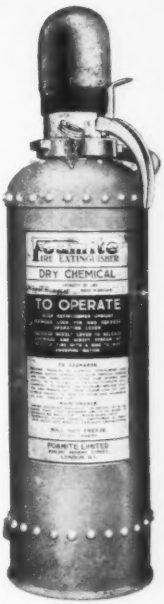

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No. 52 **APRIL, 1951** Vol. 5

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INSTRUMENT DEVELOPMENT AT THORNTON RESEARCH CENTRE*

By J. W. DRINKWATER †

The function of the Shell Company's Thornton Research Centre is to deal with applicational problems arising from the use of petroleum products in areas other than the United States. Consequently the work carried out is an intimate mixture of engineering and petroleum chemistry.

It has been found that there is a continuing demand for non-standard apparatus for the study of specialized problems. Thus it has been worthwhile to set up a small Applied Physics Section primarily for the development and manufacture of equipment for such work. It should be emphasized that this section is in no way competitive with the commercial instrument manufacturers. In fact apparatus is only made when one or other of the following circumstances make it unavoidable: first, urgency; secondly, lack of availability on the British market; and thirdly, those cases where extreme specialization makes it virtually certain that no manufacturer would develop an instrument because of the very restricted market for it.

A description will be attempted of the Section's attitude towards its work, and the way in which co-operation with the other sections of the Research Centre is achieved. The first essential is a proper humility. The Section is glad to let the chemists teach it chemistry, and the engineers engineering, because from them are required the very fullest details of the use and purpose of any proposed instrumentation. On

*Paper presented at joint meeting of Royal Institute of Chemistry and Stanlow Branch of the Institute of Petroleum, December 20, 1950.

†"Shell" Refining and Marketing Co.

many occasions the apparatus evolved from such joint discussions has been very different, and much fitter for its purpose, than was the original suggestion.

The number of jobs that can be tackled is limited, and being essentially a service section the Section is usually in the position of having more requests than it can cope with. Thus a certain amount of selection is necessary, which is based upon the following principles. In the first place those aspects of the research programme which are being given priority are dealt with. Secondly, those jobs are selected where the Section's techniques will give the best economic return, and lastly, when other things are more or less equal, the man who shouts loudest will get the most attention.

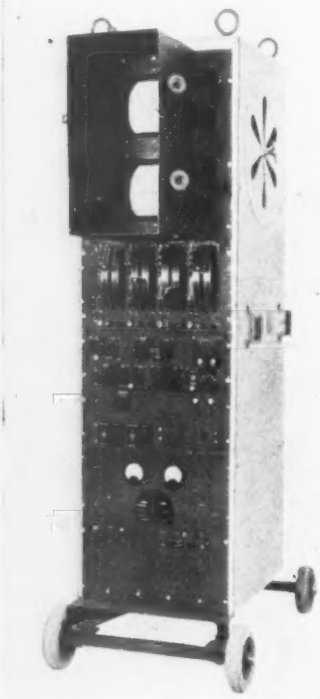

Fig. 1.
The Thornton four-channel cathode ray oscilloscope.

It has been found that most jobs start off as "just another headache." Then follows an induction period of apparent inactivity, when little active work is done. During this time, however, the various possible physical approaches to the given problem are being critically examined. If the job is eventually to turn out well, it is essential that there then occurs some small spark of inspiration which transforms the project from the "just another job" category into an intellectually stimulating development. Of course, this minor miracle does not by any means always happen, but the speaker is sure that only when it does can the best work be produced. Even so, given the right attack on a problem and a really keen interest in it for its own sake, it is still found that a final design can only be approached asymptotically. Consequently, whenever possible a "breadboard" model of an instrument is constructed to work in the laboratory in a crude form for a period, before embarking on the final stages of design. This gives an opportunity to remove the many practical snags which invariably arise, and which have not been foreseen. It is unusual to duplicate apparatus, and this fact must be offered as an excuse for the rather rough and ready finish on the instruments as compared with those available commercially.

A very brief description will now be given of a few representative examples of Thornton's instrument development.

Starting with a piece of equipment which has quite literally grown over a period of years, Fig. 1 shows a 4-channel cathode ray oscilloscope whose function is the display of up to four of the dynamic variables associated with internal combustion engines. For example, it will show simultaneously,

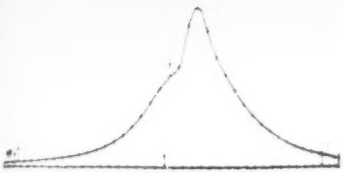

Fig. 2.

A typical oscillogram showing the cylinder pressure of a diesel engine as a function of crank angle.

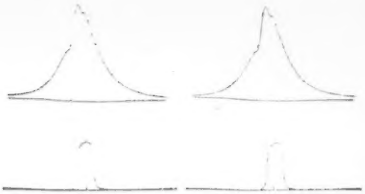

Fig. 3.

Two similar pairs of cylinder pressure and injector needle movement oscillograms. Those on the right were taken with the beam-brightening circuits in operation, as a result of which even very rapid excursions of the electron beam may be photographed.

against a common time base synchronized to engine speed, the cylinder pressure of a diesel together with the lift of its injector needle, and the pressure in the fuel line.

Fig. 2 is a typical record given by this equipment. It was obtained by photographing the face of the cathode ray tube. The camera's shutter was left open and the exposure was controlled by special biasing circuits which blanked off the spot, except for two successive excursions of the time base. This particular oscillogram is a cylinder pressure diagram, and its quality is representative of the capabilities of the apparatus. The vertical excursions of the electron beam were made proportional to cylinder pressure by applying the amplified and integrated output of a cylinder pressure transducer to the vertical deflection plates of the oscilloscope, the pick-up itself screwing into an indicator port of the engine like a sparking plug. The intensified dots are timing marks derived from holes drilled every 5° around the rim of the flywheel, while the vertical spikes serve to identify top and bottom dead centre.

One of the refinements of this apparatus is a so-called beam brightening device, whose effect may be seen from Fig. 3. The two oscillograms are similar pairs of cylinder pressure and needle-lift diagrams, taken under conditions of diesel knock. Note the very sharp inflection in the curve of cylinder pressure against time, just at the beginning of combustion. The resultant pressure rise is so rapid that on the left-hand diagram the spot of the cathode ray tube moved so fast as to be seriously under-exposed. The right-hand diagram, however, has been taken with the brightening circuits in operation. These intensify the spot by an amount proportional to its speed across the tube face, so enabling very rapidly changing phenomena to be recorded.

In the testing of fuels and lubricants for automotive engines a serious difficulty arises as soon as it is asked what test parameters shall be selected as representative of road conditions. Although a curve of road-load against speed can be determined experimentally, this applies only to constant speed running on the level, and is virtually useless as an indication of, for example, those conditions which a bus engine on a hilly route has to cope with. What is required is a device capable of controlling speed and load independently, in such a way as to simulate actual road conditions.

The apparatus shown in Fig. 4 is an engine programme controller developed for this purpose. It can be set up to provide six combinations of speed and load. The speeds are controlled by potentiometers which select the fiduci-

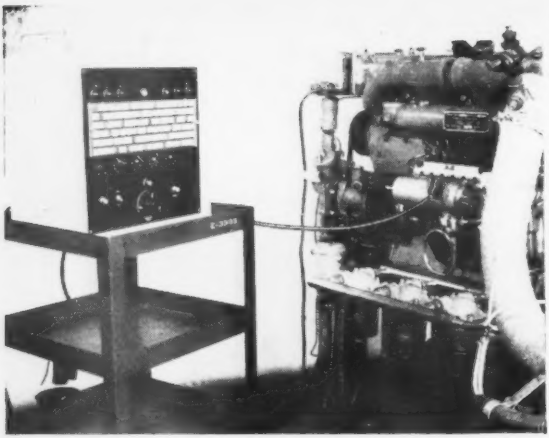

Fig. 4.

Engine programme controller applied to a diesel. The control box on the left is coupled to a fuel rack position which sets the engine load. It also actuates an electronic speed controller working in conjunction with an eddy current dynamometer. By this means independent control of speed and load is achieved.

ary voltages applied to an electronic speed controller acting on an eddy current brake, and the loads are set up by an engine mounted fuel rack positioner. The six horizontal strips on the control box make up the programme board. They are constructed from an insulating plastic and lie in metal channels. Each contains 50 metal studs, and since the basic cycle time of the controller is 50 minutes, one column of six studs is electrically live at any instant. However, only that one stud of the six which happens to be connected to a channel is effective in operating the apparatus. This critical connexion is made by painting colloidal graphite on to the plastic strips so as to bridge the gap between the studs and the channels. By this construction the advantage is gained of a visual indication of the programme that has been set up, and all that has to be done in order to set up another one is to wipe the graphite off with a damp cloth and paint on the new instructions to the equipment!

Fig. 5 shows the construction of the rack positioning unit. A similar device could of course be used to set the throttle opening of a gasoline engine. Normally the rack is located by the engagement of the cone-ended plunger P with one of six spherical-ended micrometer screws Q fixed to the end cover of the positioner. When a change of load is called for a sequence of relays within the control unit sets the following

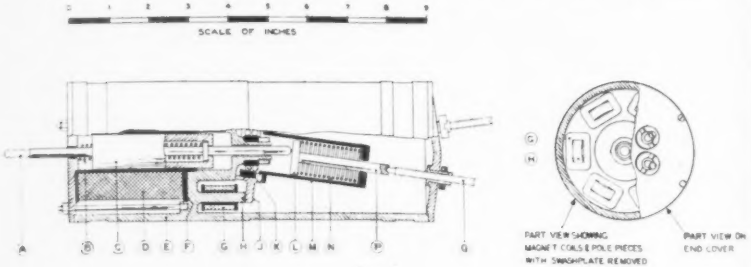
0 1 2 3 4 5 6 7 8 9
SCALE OF INCHES
A B C D E F G H J K L M N P Q
G
H
PART VIEW SHOWING MAGNET COILS & POLE PIECES WITH SWASHPLATE REMOVED
PART VIEW ON END COVER

Fig. 5.

Diagrammatic view of fuel rack positioner.

events in train. First the main solenoid retracts the central shaft A, which is connected to the fuel rack, momentarily causing the engine to idle. A weak spring N impels the plunger to follow. Then one of the six electro-magnets G, which are disposed radially underneath the steel face plate J, is excited. The face plate, being mounted on a spherical ball bearing, is free to tilt, and locates itself on the selected pole face. The current is then cut off from the main solenoid and the strong spring B forces the plunger against the new micrometer stop. Finally, the selector coil is de-energized. In practice the whole operation takes only about a second. It will be noted that the duty ratio of the solenoids is very low, so that it has been possible to keep the physical dimensions of the positioner reasonably small.

On many occasions the Section has the task of setting up apparatus for short-term programmes of research, from which finalized pieces of equipment are unlikely to result. Nevertheless, much of this work is of considerable interest. Fig. 6 shows a photograph of a bunsen type of flame taken in connexion with a study of the burning velocities of gases. It is an example of shadow photography, the optical arrangement consisting only of a small intense source of light in line with the flame and photographic plate. The major difficulty was to obtain, at short notice, a suitably small and bright light source. However, apparatus for high-speed photography was already available, and it was possible to cannibalize this to the extent of removing its high voltage, large capacity condenser. By charging this to a suitable voltage enough energy could be stored to give the necessary spark brightness. The problem that remained was how to release this energy at the right moment, as it will be appreciated that the light from the flame itself would fog the plate if a long exposure were given. The

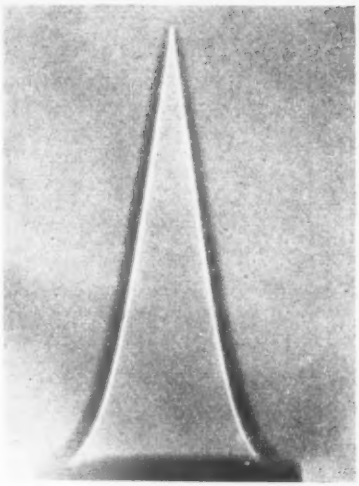

Fig. 6.
Shadow photograph of bunsen flame.

final arrangement used the solenoid-operated focal plane shutter mechanism of an aircraft camera, together with a specially devised valve circuit which produced two pulses separated by a short, adjustable, time interval. The first pulse opened the blind, and the second closed it, simultaneously initiating a pilot discharge from a needle-sharp electrode in close proximity to the main spark gap, the resulting ionization causing the latter to break down almost instantaneously.

Even the humdrum job of duplicating apparatus of American design can call for the exercise of ingenuity in matters of detail. Fig. 7 shows a Thornton-made dual titrometer whose design departed as little as possible from that of our associates of the Shell Development Company. However, while their equipment made use of small shaded pole induction motors directly coupled to the stirrers and speed controlled by rheostats, the whole assemblies being extremely compact, no comparable motors were available here. British

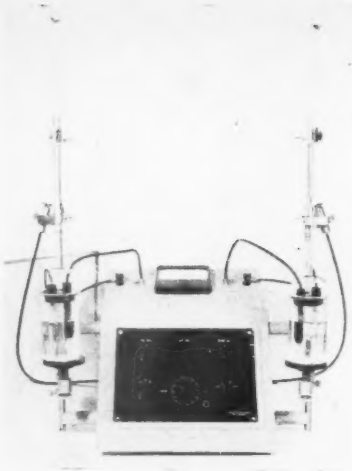

Fig. 7.

Thornton-built dual A.C. titrometer, based on Shell Development Co's design.

motors were rather large to be mounted in this way. Consequently, a constant speed capacitor motor was housed in the base of the instrument and flexible drives were taken to two variable speed stirrer heads. These can be seen in more detail in Fig. 8.

The drive is taken to a rubber-tyred wheel which is spring-loaded against a cone carrying the chuck and stirrer. The friction wheel can be translated axially to alter the speed ratio.

Severe practical difficulties faced Thornton's pilot plant chemists when they tried to meter thick detergent slurries into a small-scale spray drier. The flows required were of the order of 1 cubic centimetre per second, and the materials to be pumped had about the consistency of thick porridge. Their structure was also rather similar, for they contained a proportion of undissolved crystalline material. These caused the almost immediate seizure of small mechanical pumps. On the other hand, if pumps were dispensed with and the material was allowed to flow to the atomizer by gravity alone it clogged the feedpipe, even when steam heated. Dilution of the slurries was not permissible, as it was essential not to change their constitution. After a certain amount of experimenting a very simple peristaltic pump was designed. It is seen in Fig. 9 and takes the form of a rubber tube lying in a half-bearing, and stroked by rollers. The particle size distribution from the atomizer, which is a function of delivery rate, was of particular interest so the centre of rotation of the rollers was offset from the centre of the arc of the rubber tube in such a way as to cause their pressure to be applied and released gradually, thus minimizing surges. This pump permitted runs of a few minutes duration, after which the original atomizer would block. The cause of this was faulty aero-dynamic design, which allowed the slurry to build up on the nozzle tip. It was finally cured by a complete re-design of the nozzle, after which the real experiments could begin.

Fig. 8.

Variable speed stirrer head.

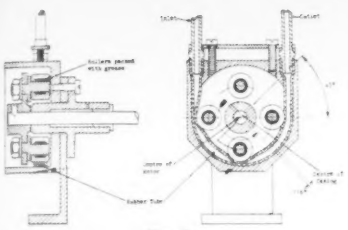

Fig. 9.

Peristaltic pump for handling small flows of thick slurries.

The apparatus is shown working in the laboratory in Fig. 10.

This work was carried out by members of the Section's staff who specialize in the problems of fuel injection in diesel engines, and the study of the characteristics of the spray nozzles used in gas turbines. The speaker regards it as a good example of the way in which one technique can help another in the vast field of the petroleum industry.

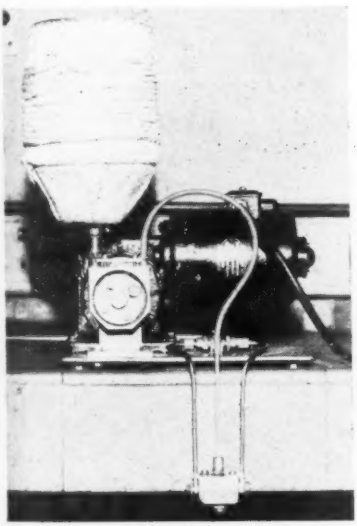

Fig. 10.

Slurry spraying set-up in the laboratory. The feed from the lagged tank is pumped into a nozzle, where it is atomized by an air blast.

Electronic Engine Indicator

Following Dr Drinkwater's talk R. C. Robson gave a brief exposition of the portable electronic engine indicator he had developed for the use of the "Shell" group's field engineers, and then proceeded to demonstrate the apparatus on a special test rig. This consisted of a fuel injection pump driven by an electric motor and equipped with pick-ups to permit the display, on a cathode ray tube, and against a synchronized time base, of pressure in the fuel line, lift of the injector needle, and pump vibration. It was explained that, in order to avoid modifying engines in the field, a hand synchronizing unit was available. However, for demonstration purposes pick-ups were used which produced, from holes drilled in the rim of a flywheel, voltage pulses for locking the time base to the pump speed. A stroboscopic lamp formed part of the equipment, and was used to determine the timing of pump events. This was done by making its firing point adjustable, and indicating this instant by the simultaneous generation of a marker spike on the needle-lift or other oscilloscope diagram. By slowly varying the timing of this lamp the growth and decay of the jet of fuel was beautifully demonstrated.

Oxygen Absorption Test

A new and automatic apparatus for the measurement of the rate of absorption of oxygen by oils was demonstrated by A. J. Davies. The instrument represented a successful attempt to take the drudgery out of a routine test developed by Thornton's chemists. This object had been achieved using principles no more recondite than Boyle's law and Faraday's laws of electrolysis, the action of the apparatus being to add oxygen, automatically and electrolytically, to make up for that

absorbed by the oil under test. The total oxygen that had been supplied to the system could then be found by integrating the current which had passed through the generator cell. This was accomplished by passing the same current through a robust integrator cell in series with the former, the mixed hydrogen and oxygen being allowed to build up a pressure which was displayed on a commercial circular chart recorder scaled directly in millilitres of absorbed oxygen. The apparatus consisted of two units sharing a common oil bath, which together with the glassware was arranged on one side of a vertical mounting board. The other side of this board, which was rotatable about a vertical axis, carried the duplex pressure recorder. By virtue of this construction the glass part of the apparatus was readily accessible for setting-up purposes, and yet during the course of a test the progress of the oxidation was clearly visible. A feature of the talk was the speaker's story of the failures which preceded success, even in the case of an apparatus as fundamentally simple as this.

Evaluation of Wear

The meeting ended with J. C. E. Button's discussion of Thornton's work on the evaluation of wear by tracer methods. In the first instance, what was thought to be a technically simple case was attacked, the problem being to attempt a direct determination of the wear of wire-drawing dies. These consist as to about 90 per cent of extremely hard particles of tungsten carbide, embedded in a cobalt matrix. The experimental procedure was to send a die for one week's irradiation in the neutron flux of the Harwell pile. During this period the short-lived tungsten isotope of mass 187 becomes extremely radioactive. On removal from the pile, the die was housed in a lead "castle" and hurried to Thornton, where short lengths of copper wire were drawn through it, using a simple vertical drawbench. The first technique employed for detecting the active wear débris adhering to these wires was autoradiography. From the examples shown, the characteristic irregularity of the wear was very obvious. The next step was to evolve a more quantitative technique, by winding the drawn wires, in the geometrically reproducible form of close helices, about a Geiger-Müller tube, and counting, with the help of a scaling unit, the nuclear disintegrations due to that minute portion of the "hot" die which had been transferred to the wires. The results of this technique were not very encouraging, wires drawn under seemingly identical conditions giving widely different counts. It was thought probable that this was a result of examining the wear in too fine detail. Mr Button concluded by describing the health precautions to be adopted when working with "hot" materials, and demonstrated a special handling tool designed to facilitate the assembly of a piston ring on to its piston.

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COMPANY PRODUCTION
—CRUDE OIL

	1951 *Jan.*	*Feb.*
	brl.	
Kern Oil Co.		
California	110,563	101,663
Trinidad	53,291	50,521
	163,854	152,184

	Feb. 1951 brl.
British Controlled Oilfields Ltd.	
Venezuela:	
Western area	12,029
Central area	15,047
Trinidad Petroleum Development Co.	228,392

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Farm Tractor Care. "The book of the film" is now available for two of Shell & B.P. Farm Services' agricultural films, "Smoke Signals" and "Diesel on the Farm."

THE FUTURE OF THE OIL INDUSTRY *

By HOWARD W. PAGE †

The future prospects of the oil industry are excellent. That is an easy conclusion to draw from the past and present. Consumption of petroleum has increased steadily with only infrequent and small reverses over a period of a great many years. People's needs for oil are really far from satisfied because surely no-one can claim that people's desire for better living conditions are satisfied. There is no saturation point foreseeable in our lifetime.

The future prospects are also good because of the dynamic quality of the industry, and the skill and ingenuity of those who work in it.

There was a school of thought that a refinery should be built at the source of crude oil—or at least at the tidewater terminus of a pipeline. The reasons were obvious—no hauling of refinery fuel and loss—no redistribution of the refinery products—no small inefficient refineries serving only one market. Before the war this idea was usually economically correct. Where refineries, other than for specialty products, were built near the markets they often required subsidies to survive. Why, then, is this not correct today? Just as with driving a car in different countries, what is wrong at one time can be right at another.

The first answer as to the reason for the change might appear to be the currency problem. That has had an influence without a doubt. However, the change would have occurred even if the world's currencies were freely convertible. There is a combination of reasons most of which stem from increasing consumption. The large efficient tankers in operation and under construction today can be used effectively only where there are large oil requirements at a single port. There were very few such ports outside the United States before the war. There are many now because of the phenomenal growth in use of petroleum. Efficient tankers, in turn, reduce the cost of hauling refinery fuel and loss, thus reducing the inherent disadvantages of refineries located at a distance from crude oil supplies.

The growth in demand has resulted in the need for more refineries elsewhere. In many countries, such as England, the demand for petroleum is such as to require large and efficient refineries to supply the local market.

This situation in turn has led to other developments—the most striking of which is the development of crude oil production in the Middle East. It was known for many years that there were ample crude reserves in the Middle East. The question was—where to go with the crude oil? Crude oil as such is a practically worthless substance. Without refineries it has no market.

The development of Middle East crude reserves was held back, before the war, not by lack of potential reserves, but by lack of refining capacity in tributory areas. The post-war building of refineries in Europe which resulted from increasing product requirements, provided an outlet for Middle East crude. The outlet was sufficient to justify rather heavy expenditures of capital for development of production and for pipelines to bring the oil to seaboard. Developments on this large scale reduced costs which in turn made it more economical to supply European product requirements by refining Middle East crude in Europe and more economic than the use of

* A summary of an address to the Fawley Branch of the Institute, October 11, 1950.

† Anglo-American Oil Co. Ltd.

Western Hemisphere crude at the source. Thus there was a basic economic pressure for more refineries in Europe and for more Middle East crude and it is interesting to note that once a certain point was reached, the gradual evolution changed to a snowball.

Now as to the future, after Fawley and similar refineries are in operation and the full oil requirements of the Eastern Hemisphere are produced and refined here, the question is, what other changes will there be? Once the point is passed where the deficiency which was formerly supplied by the Western Hemisphere has to be made up, the snowball will slow down. but it will not stop—unless artificially stopped by outside interference. The oil needs of people in the Eastern Hemisphere are far from satisfied. With growing populations, more mechanization, improving economies, desire for higher standards of living, there is no ceiling. Even artificial deterrents to consumption and to improved living standards such as high taxation of petroleum products will not completely stop the upward trend.

The future of the oil industry is usually thought of in terms of technical developments, increasing consumption, new products and new sources of supply. Items come to mind such as new jet bits used in drilling oil wells at rates of over 2000 feet in an 8-hour shift. One can speculate on the possibility of future revolutionary methods of locating oil reserves and many other technical advances.

But there is another aspect. The problems of the future will involve, more and more, the need for careful economic analysis. The trend of the future is for larger units—refineries, tankers, pipelines, product terminals and, where possible, oilfields. Small savings per gallon will result in very large savings overall—much too large to ignore in a competitive economy. The day has gone when efficiency could be left to guess work, hunches, and copying the past. Careful evaluation of the financial aspects of every project and operation will be needed to keep pace with the competition.

Progress in developing and applying sound methods of economic analysis have lagged behind progress in other technical developments. There are many operations and projects where optimum efficiency can be assured by correct economic analysis alone. There are others where political, social and human relations factors must be considered. Even in these cases a sound economic analysis is helpful in arriving at decisions.

The term "optimum efficiency" is used advisedly. Greater efficiency can always be obtained by capital expenditures but there is a limit to the amount of capital available. If the capital expenditure on a cost reduction project does not bring as high a return as on new production projects, then the gain in efficiency has certainly passed the optimum. This is sometimes forgotten by those who are thinking in terms of lower cost, but there is always the cost of the lower cost.

There is an important subsidiary effect to be considered in the increased development and use of economic analysis. The rigid logic required trains the mind to approach other kinds of problems in a logical manner. It creates a desire to search out new and better ways of doing things. It teaches one not to accept something simply because it was done that way before. In short, such training helps to create the type of mind which is essential to management in the petroleum industry—a large, complex and dynamic industry which calls for the best in all the skills.

Probably more careful economic analysis is applied to refining problems than any other part of the industry. Most of those who are skilled in techniques of analysis either work in refineries or learned their skills there.

The number available to the industry as a whole, however, is far too few. And the problems where economic analysis would be helpful will be far too many for the people at present available.

The means of increasing the numbers and improving the techniques in this field rests principally, but not entirely, with management. Universities will no doubt provide more basic training in this field when they see the demand for it. Organizations, such as the Institute of Petroleum, can promote progress by having talks given by men familiar with this work. Even those whose work does not bring them in direct contact with this kind of analysis would find that some knowledge of the methods of the logic which is used will help them in solving their own problems.

Perhaps the impression has been given that economic analysis is the only important problem of the future. However, there are others just as important, if not more so. Public relations is one —and one in which our skills are not yet as great as in the technical fields. More and more the opinion of people is becoming a considerable force in the operation of any business. This is just as true in England, in the speaker's opinion, as it is in the United States.

Public relations consists, essentially, of recognizing the human viewpoint and explaining what is being done in the light of that viewpoint. Development of the analytical approach to problems should be helpful—in fact essential to such understanding.

As has been stated before, the future prospects of the oil industry are excellent. But to turn these prospects into reality will not be easy at any time. The world is moving and the oil industry must move with it—in fact, always a bit ahead of it. To do this requires an analytical approach and better understanding of human problems. Will progress in this field be as rapid as it has been in others?

Discussion

In the discussion that followed, the speaker was questioned on a published reference to an area, covering the North Pole, as a potential field for oil. Was this pure geological speculation or could oil wells be envisaged there in the future?

Mr Page said the only place he knew anything about was one called Point Barrow in the Arctic Circle in which the U.S. Navy had found considerable evidence of oil, but there was nothing yet known as to whether or not there could be large-scale oilfields there. Oil at the North Pole was not really worth very much—at least at the present time. The best example of that was that it was thought there was a tremendous amount of oil in the mountains behind Peru and a study was made of it, but it was found that in the first place, in order to make it ever pay, a production of not less than 300,000 barrels a day would be needed. Looking to the long-term view, the speaker was sure there was oil in places that are not being considered today and that would have to be exploited when the more efficient sources gave out. In Canada there were the Athabaska tar sands up in the central northern part of Alberta which, theoretically, contain more oil than all the oilfields in the world, but the cost of getting that oil out made it an uneconomic proposition today. In fifty or more years from now it might be different.

On the question of whether crude prices would rise still further, Mr Page said that he considered that the costs of producing oil in the very difficult areas, such as the one mentioned in Peru, were bound to be higher. On the other hand, the larger scale operations and the new economies would tend to continue to level that off so far as the price to the consumer was concerned. In other words, it was possible to increase the cost of production 50 per cent and still, over a period of time, by other economies, keep that cost from being passed

on to the consumer. Therefore, he did not look for any great increase or perhaps any increase at all in the price of oil products in relation to the price of other commodities for quite a few years.

Mr Page was asked whether, taking a long-term view, atomic energy was likely to affect the oil industry and, in turn, by reducing the demand for fuel, lower its price and so raise the price of distillate products. Did the industry envisage reducing bunker production?

Mr Page said that his company's research staff, together with others, had made a considerable study of atomic energy and it was their considered opinion that it would not be competitive even for large power plants on a normal commercial basis for some years to come. On the other hand, it should not be entirely left out of future considerations. There were problems which could be solved by use of atomic energy to bring its cost down to one which would be a little lower than the present coal and fuel oil costs. If that happened and there was a lessening of demand for residual fuel oil for such a reason, he thought the industry would turn to converting residual fuel oil to other products. In the United States, the average yield of residual fuel oil—nationwide—had been reduced from 25 per cent overall yield on the crude down to 19 per cent at the present time. That included California which had a lot of very heavy crudes.

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NEW TANKER COMPANY

Orders have been placed with British shipyards for 10 tankers of about 16,000 d.w.t. which will be owned and operated by a new company which is being formed jointly by Anglo-Iranian Oil Co. Ltd., Common Brothers Ltd., and Matheson & Co. Ltd. The tankers, which are due for completion 1953/4, will be chartered by Anglo-Iranian.

PERSONAL NOTES

G. Noble, M.Inst.Pet., has been appointed refinery manager in charge of all refining and manufacturing activities at the Esso Refinery, Fawley. Mr Noble, who has been connected with the petroleum industry for the past 24 years, was at one time assistant process manager at the Sarnia refinery of Imperial Oil Co. of Canada. He is a J.P. of the County of Southampton.

Dr F. Mayo, A.M.Inst.Pet., has become assistant refinery manager at Fawley refinery. Recently he was engaged as assistant general superintendent in charge of training activities at Fawley.

Another new Esso appointment is that of **C. R. Young,** F.Inst.Pet., as assistant refinery manager in charge of administration and staff departments at Fawley. Mr Young joined Anglo-American in 1941, after having had experience in Persia and Roumania.

Captain J. B. Macarthy, O.B.E., has succeeded **Captain A. R. Hicks, O.B.E.,** as Commodore of the Eagle Oil and Shipping Co's fleet.

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Aromatic Solvents 23-5, 23-7 and 23-9, obtained from the Catarole petroleum cracking process are described in Leaflet No. 4a, which may be had on application to the Sales Dept. Petrochemicals Ltd, 170 Piccadilly, London, W.1.

FIRST TANKER AT FINNART

The first cargo of crude-oil to reach the new oil dock at Finnart on Loch Long consisted of 22,400 tons of oil from Kuwait, Persian Gulf, and was brought by the Norwegian tanker *Tank Empress* (24,000 tons deadweight) on charter to the Anglo-Iranian Oil Company, Ltd.

The Finnart depot is connected with the expansion project of Scottish Oils Limited, which is raising the capacity of its Grangemouth refinery from 600,000 to 1,800,000 tons per annum. The depot will be connected to the Grangemouth refinery by a 12-inch pipeline, 60 miles in length, stretching across Scotland from Loch Long to the Firth of Forth. This is now nearing completion.

Work on the Finnart depot was begun in May 1950 and despite difficult conditions, including 11.8 inches of rainfall in one month alone, it was ready to receive the first cargo on February 5, two months ahead of the originally scheduled date.

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AMBULANCE FOR OILFIELDS

A new Humber Pullman ambulance specially designed for oilfield use was recently shipped by Shell to the Lake Maracaibo fields. The vehicle, which cost about £1500, is fitted with an all-metal body with Double Skin insulated roof. It has a 4-litre engine, developing 100 b.h.p., and standard tyre equipment.

Inside the body is a one-man operated wheeled stretcher on rubber tyres and a folding emergency stretcher. Fitments include a wash-basin with water supply, first aid kit, thermos flasks, electric fans, and a searchlight to help in loading.

Interior view of the ambulance showing the one-man operated wheeled stretcher.
(A Shell photo)

E. A. EVANS

The retirement is announced of Elliott A. Evans, M.I.Mech.E., F.R.I.C., chief chemist of the Wakefield Group of Companies.

Mr Evans' career in the service of the House of Wakefield began on May 1, 1915, when, at the age of 24, he joined the company. He is probably best known for his pioneer work in the use of metallic soaps in hydrocarbon oils. His first patent in this connexion was taken out in 1926 and that for blends of tin and chromium soaps in 1935.

The esteem in which Mr Evans is held throughout the industry may be found in his record of service to the various learned bodies associated with it. He joined the Institute of Petroleum in 1916, became a member of the Council in 1933 and was elected a Fellow in 1939. He has taken an important part in the work of the Institute's Standardization Committee. In 1948, he was elected President of the Institute. He is also a member of the Oil Consumers' Council and Chairman of the Classification of Mineral Oils Panel of the British Standards Institution. A Member of the Institute of Mechanical Engineers, Mr Evans is the present Chairman of its Automotive Division.

His book "Lubricating and Allied Oils," first published in 1921 and now in its third edition, is regarded as a standard work on the subject. He is also the author of innumerable scientific papers dealing with every aspect of lubrication.

Although Mr Evans now takes his leave, his knowledge and experience is not entirely lost to the Wakefield Group, since he will be available as a consultant. He retires to his farm in Cheshire near the scene of his boyhood days. We are sure his many friends in the industry will wish him health and happiness in the years to come.

Consequent upon Mr Evans' retirement, the following appointments within the Wakefield Group of Companies are announced:—**G. H. Thornley,** M.Sc. (Tech.), F.Inst.Pet.—Group technical manager; **P. W. L. Gossling,** B.Sc., F.Inst.Pet.—Group laboratory manager; **J. S. Elliott,** M.A.—Group research chemist; **N. E. F. Hitchcock,** B.Sc., M.Inst.Pet.—Group development chemist.

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WORLD PETROLEUM CONGRESS

The Organizing Committee of the Third World Petroleum Congress is anxious to secure the assistance of those who propose to attend the Congress and who possess qualifications to act as interpreters to translate speeches from French into English. Those prepared to offer their services will naturally choose the sections dealing with subjects well-known to them.

Interpreters will be given the opportunity of translating the fundamental points of speeches at short intervals. Microphones will be provided.

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50th Anniversary. Esso Standard (Malta) Ltd, which has only 43 employees, six motor trucks and one horse-drawn tank wagon, is celebrating its 50th anniversary.

COUNCIL COMMENTARY

The March meeting of Council was held on March 7, with the President in the chair. Members heard with regret of the death of Mr J. Kewley—a Past-President and an Honorary Fellow of the Institute—and all stood as a mark of respect.

The Annual Dinner, held on March 6, was an outstanding success and Council congratulated the President whose personal efforts had so greatly contributed to the success of the evening. The President in turn paid tribute to wholehearted co-operation he had received from the Institute's staff.

There was a great deal of discussion on Anglo-American co-operation in the field of standardization. Mr Hyams' recent visit to the U.S.A. had showed clearly that the A.S.T.M. were eager to collaborate with the Institute in these matters.

Continuing the review of I.P. representation on outside committees Council considered a list of I.P. representatives on main B.S.I. committees. The institute has seven representatives on the Petroleum Industry Standards Committee. Three of these—The President, Mr J. Oriel and Mr H. C. Tett wish to resign and they have been replaced by Messrs E. A. Evans, W. S. Ault, and Col. Auld. It was suggested that Col. Auld should be chairman in place of Mr Oriel.

On the Petroleum Equipment Industry Standards Committee, Messrs E. J. Sturgess and J. S. Parker were nominated in place of two of the existing committee who wish to retire.

The draft of the Annual Report for the year ending December 31, 1950 was discussed and agreed after a few minor alterations and amendments.

Arrangements for the Cadman Memorial Lecture and Dinner were reviewed. It had been decided to make the dinner a Council function limiting the number to 50. The President, however, is in favour of enlarging this somewhat, and inviting a certain number of company executives to meet Dr R. E. Wilson. This was agreed and it is now proposed to hold a dinner for a maximum of 80 people.

A meeting of the Ad Hoc Committee to discuss the setting up of an Institute Research Fund was reported to Council. The Hydrocarbon Research Group is financed by a number of sponsoring companies and has an income of around £8,000 per annum. Requests are received from time to time for the Institute's help in sponsoring small research projects that are outside the orbit of this group; and it was felt that there should be a separate Institute Research Fund which could deal with small projects of this kind.

It was unanimously agreed that such a fund should be started. The I.P. Research Committee would then be in a position to foster small projects with a view to developing them to a stage at which they would be of interest to the major companies. These would then be approached for financial assistance on the lines of the Hydrocarbon Research Group. It was recommended that no single project should be financed for a larger sum than £350 per annum and that the sum of £1000 should be set aside for the Research Fund. Council would have to approve all projects before financial assistance was given. These recommendations of the Ad Hoc Committee were agreed.

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PRODUCTION AT SERIA

Oil production from Seria, in Brunei, North Borneo, has reached a rate of 100,000 b.d., or about 5 million tons annually.

Discovered in 1929, by 1940 the field was producing at the rate of 1 million tons per annum from nearly 150 wells.

AROUND THE BRANCHES

FAWLEY, LONDON, NORTHERN, SCOTTISH, SOUTH WALES, STANLOW, TRINIDAD

Fawley Branch

The March meeting of the Branch was held at the Esso Recreation Club, Holbury, on March 14.

I. McCallum was in the Chair and introduced the Speaker for the evening, A. W. Becke, of technical sales department.

A. W. Becke, prior to joining the Anglo-American Oil Company, had been, for many years, associated with the motor car industry, both as a designer and as a racing motorist. R. Tanner, the competition manager of the company, had very kindly come with Mr Becke to give a running commentary on some racing films.

Mr Becke prefaced his talk on "British Car Design and Performance" by telling the audience that he proposed to discuss only the fuel side of car design. He then gave a very interesting talk illustrated with lantern slides showing the relative advantages and disadvantages of different pocket valve arrangements. He pointed out that the side-valve design was limited as to the level of octane fuel which could be utilized in this type of engine and that in view of the upward trend in octane ratings, most car designers were swinging over to overhead valve mechanism. This trend enabled the designer to reduce the volume in the cylinder head at top dead centre.

Mr Becke then discussed the different induction pipe designs and showed the difficulties which are encountered in unequal distribution of fuel to the cylinders in a four-cylinder engine, and various methods which were used to combat this difficulty.

At the conclusion of the talk, Mr Tanner showed three racing films which were both exciting and amusing.

After the film show, Mr Becke answered a number of questions put to him by the audience and in conclusion Mr Jagger proposed a vote of thanks for a very interesting talk and film show which Mr Becke and Mr Tanner had given.

London Branch

The Branch's sixth meeting of the 1950/51 session was held on February 21 at Manson House to hear F. N. McLaren, specialist adviser on the textile industry to the Anglo-American Oil Company Limited, read an authoritative and comprehensive paper entitled "Petroleum in Industry IV—Textiles." In the absence of N. E. F. Hitchcock, the Branch chairman, due to influenza, the chair was taken by A. W. Deller, recently-elected vice-chairman in succession to R. D. Streeton, a founder-member of the Branch and committee member of the pre-war Student's Section, whose transfer to Manchester had regrettably compelled his resignation.

Mr McLaren devoted the first part of his lecture to a survey of the long history of the British textile industry, leading up to a necessarily brief description of the astonishing complexity of its present-day organization; this certainly taught at any rate the southerners in the audience a great deal they did not know about one of the country's major industries. There followed an agreeable documentary film, in colour, about the tweed industry of the Border country, which, together with some informative lantern slides, helped the uninitiated to a better understanding of an involved subject.

The second half of the paper described the varied part played by petroleum in

the making and processing of textiles. The importance of oil as a fuel was decreasing, due to the replacement of steam engines by electric motors integral with each machine. Lubrication in the past had been by mineral oils compounded with fatty oils, which could be washed from the products without staining; development today was tending in the direction of "tacky" oils, which stayed on the bearings, and improved washable mineral oils incorporating emulsifiers. In general, throughout the industry, large consumption of relatively cheap lubricants was giving place to a smaller consumption of much more specialized oils.

Another important field was that of process oils, whose primary duty is to lubricate the fibres during carding, etc; here again mineral oils were now reaching a stage where they could compete with the various fatty oils which had hitherto reigned supreme. Finally, mention was made of two new outlets for petroleum in textiles—the synthetic fibres and the new detergents derived from petroleum.

In the course of the discussion following the paper, Mr McLaren, from his wide knowledge, gave further interesting glimpses of the future. P. C. Grocott aptly expressed the gratitude of an appreciative audience in proposing a vote of thanks at the close of the meeting. Afterwards a good number of members joined in the customary drink at the Bolivar and several stayed for the small dinner at which the speaker was as usual, the guest of the Branch.

Northern Branch

At the meeting held on February 20 A. Prizeman of the Anglo-American Oil Company gave an interesting talk on "The Background of Performance Testing of Lubricants." The lecturer led his listeners through the various steps necessary before the very costly full-scale engine tests were undertaken, and explained how the various chemical and physical tests, rig and full-scale tests, built up to provide a complete picture of the probable performance of the lubricant in service.

In the discussion which followed, the necessity for British engine test methods which should if possible be far cheaper and quicker to perform was stressed by several speakers, including E. J. Dunstan, who also proposed the vote of thanks to Mr Prizeman which was carried with enthusiasm.

South Wales Branch

The Annual General Meeting of the South Wales Branch was held at Llandarcy on February 6, 1951, the Chair being taken by the Chairman, E. S. Squire.

It was announced, that as a result of the Ballot, Messrs R. B. Southall, E. J. Horley and J. A. Green had been re-elected, thus the constitution of the Committee for 1951/52 remained the same.

Messrs C. E. and E. J. Jones were thanked for their services as auditors, and having agreed, were unanimously elected for a further period of one year.

The Chairman, in the course of his report, mentioned that although the overall membership of the Branch remained the same, there was a definite swing from Branch to Corporate membership. He expressed disappointment in the falling away of numbers of student members and hoped that efforts would be made to bring up the numbers. He felt that the members' thanks were due to the National Oil Refineries Limited, for the facilities given to the Branch.

Amongst other matters discussed, was the question of social functions and it was decided to circularize all members to ascertain their views, since there had been some difficulties in meeting the ideas of some members.

A vote of thanks to the Chairman and to the Hon. Secretary was carried by approbation.

PETROLEUM IN PARLIAMENT

Petrol Consumption

The Parliamentary Secretary to the Minister of Fuel and Power said (February 12): In the 35 weeks from the 26th of May, 1950, to 25th of January, 1951, the deliveries of motor spirit by the bulk distributors of petroleum averaged 104,400 tons a week. That was 11,000 tons a week more than in the corresponding period of the year before.

Oil Agreement, Persia

Asked about the negotiations between the Persian Government and the Anglo-Iranian Oil Co., the Under Secretary of State for Foreign Affairs said on February 21: The agreement (signed by the company and the Persian government in July, 1949) was recently presented for ratification to the Persian parliament which referred it to its oil commission which, after reporting unfavourably on it in general terms, has now been instructed to review the position further.

H.M.G. cannot be indifferent to the affairs of this important British interest. The company's present concession is valid until 1993 and H.M.G. are confident that Persia will honour her agreement. As to the supplemental agreement, H.M.G. regard it as fair and reasonable.

Answering a further question, the Under Secretary said as far as he was aware no proposals had been made for the nationalization of the Anglo-Iranian Oil Co.

Asked on March 14 if he would make a statement on the threat to British oil rights in Persia, the Minister of State for Foreign Affairs, said in a written answer: No representation has been received from the Persian Government regarding the nationalization of the Company's installations in Persia. The present position on the Persian side, I understand, is that the Oil Commission of the Persian Parliament has unanimously passed a resolution to the effect that the proposal that oil should be nationalized throughout the country has received its "attention and acceptance"; since, however, time was too short "for study of the application of this principle," the Commission has asked the Persian Parliament to grant it an extension of time of two months. The Commission's resolution is now before the Persian Parliament.

On the Company's side, I understand that they for their part are willing to discuss an agreement on what can perhaps best be described as the basis of an equal sharing of profits in Persia and had so informed the Persian Government before the recent unfortunate developments in Tehran.

As my hon. Friend also made clear on February 21, 1950, the Company's present Agreement with the Persian Government is valid until 1993; and I would add that His Majesty's Government are advised that under the terms of that Agreement the Company's operations cannot legally be terminated by a unilateral act of the Persian Government.

His Majesty's Government cannot be indifferent to the affairs of this major British interest. His Majesty's Ambassador at Tehran has accordingly been instructed to present forthwith to the Persian Government a Note on the subject.

Lubricating Oil Tests

Asked what arrangements it had been possible to make to pool U.S. and British resources for the type testing of lubricating oils and hydraulic system fluids for vehicles and aircraft, the Minister of Supply said in a written answer (March 5) that there was close collaboration between the authorities

in Britain and U.S. for the production of standard methods of test in this field.

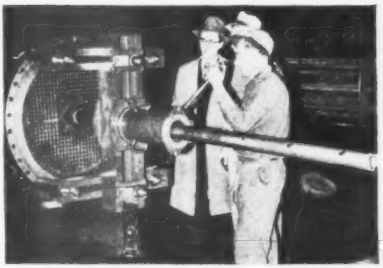
Consumption of Petroleum Products

The consumption of refined petroleum products in Great Britain for industrial purposes other than traction is estimated to have been 2½ million tons in 1938 and 5½ million tons in 1950, said the Minister of Fuel and Power in a written answer (March 5). The amount consumed for industrial traction (including agricultural traction) was approximately 2 million tons in 1938 and 3½ million tons in 1950.

Naval Fuel

During the recent debate on the Navy Estimates, Mr J. Callaghan (Parliamentary and Financial Secretary to the Admiralty) said: One of the means of standardization that is now being considered is in respect of common specifications for the fuels that are used by all the ships of all the navies—obviously, a most important point—in order that they may mutually refuel each other at sea. Provision is also being made for refuelling equipment which will enable refuelling to take place in most North Atlantic Treaty ports.

EXCHANGER JACK



A special exchanger jack for the removal of bundles in shell and tube heat exchangers has been developed by the K. W. Kellogg Co of Jersey City, N.J. The company claim it will save construction costs, for exchangers supported above the ground, by eliminating conventional pulling beams and their related structures.

The tube bundle removing device consists of a modified commercial centre-hole hydraulic puller. It has an extensible, jointed ram and an adjustable yoke to transmit force against the bonnet end shell flanges of exchangers of various sizes. The device can exert a push on the tube bundle up to 12,000 lb for a maximum distance of 16 feet.

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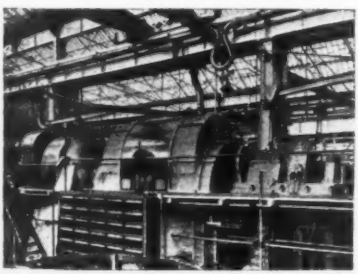
TURBO-ALTERNATOR FOR VENEZUELA



A 10,000 kW turbo-alternator ordered by Shell in 1948 from Parsons & Co of Newcastle-on-Tyne and completed six months ahead of schedule is now on its way to Pueblo Viejo in Venezuela.

The plant, which cost approximately £85,000, is scheduled to begin operation about the middle of this year, and will provide additional power for oilfields and camps along the eastern shore of Lake Maracaibo.

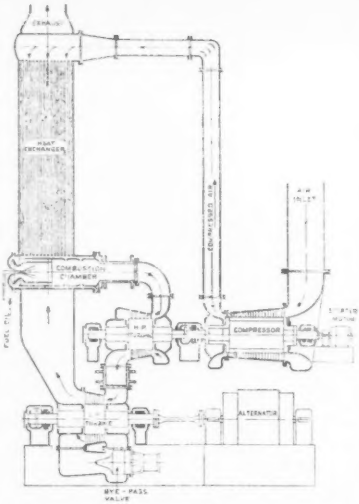
GAS TURBINE FOR D.E.S. AURIS

For the purpose of obtaining operating experience with a main propulsion gas turbine set under service conditions at sea, one of the four diesel engines of the 12,000-ton tanker *Auris* is to be replaced by a gas turbine, the ship having been specially built with this in view.

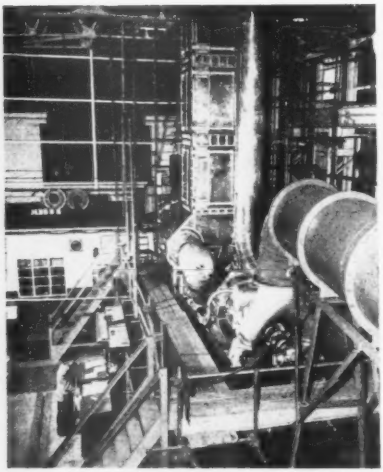
This gas turbine alternator set was built at Rugby by British Thomson-Houston, who recently invited visitors to inspect it, after it had been running for some time on test.

Preliminary testing took place during 1950 and performance and endurance tests were carried out from January 1 to February 9, 1951, during which period the set was operated for 528 hours. The set is made up of three assemblies—low pressure turbine-alternator unit, compressor/high pressure turbine unit, and heat exchanger and combustion chamber unit.

The set is designed for an ambient air temperature of 68°F, and a turbine inlet temperature of 1160°F, the maximum permissible operating temperature being 1,200°F. The design speed is 5750 r.p.m. for the compressor/high pressure turbine shaft, and 3000 r.p.m. for the low-pressure turbine-alternator shaft. At the design conditions, the output is 1200 b.h.p. at the low-pressure turbine coupling or 860 kW at the alternator terminals. Fuel consumption is estimated at 860 lb/hr.



Diagrammatic layout of gas turbine set.



View of the high pressure turbine and compressor unit, from compressor end.

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Persian Production : Production of crude in Persia for the month of December, 1950 amounted to 2,945,000 tons. Provisional total production for the period January 1 to December 31, 1950, amounted to 31,750,000 tons. During January, 1951, production was 2,625,000 tons.

Kuwait Crude. Production of crude oil in Kuwait for the month of January 1951, was 1,767,808 tons.

U.K. PETROLEUM TRADE IN 1950

By GEORGE SELL (Fellow)

TABLE I
QUANTITY AND VALUE OF U.K. PETROLEUM IMPORTS

	1950		1949		1948	
	Quantity 1,000 *gal*	*Value* £	*Quantity* 1,000 *gal*	*Value* £	*Quantity* 1,000 *gal*	*Value* £
Crude petroleum .	2,377,307	74,519,872	1,546,243	40,174,686	1,174,228	31,062,061
Motor spirit . .	1,221,064	59,479,535	1,341,151	53,456,922	1,183,592	46,812,044
Other spirit . .	30,309	1,686,782	30,638	1,359,918	29,595	1,372,844
Kerosine . . .	387,820	17,244,972	433,704	15,425,900	406,304	14,960,804
Lubricating oil .	120,048	10,197,362	72,749	5,176,984	86,390	7,847,947
Gas oil . . .	369,537	15,185,747	457,881	14,859,775	476,343	17,279,617
Fuel and diesel oils	575,060	14,887,128	776,242	16,426,646	1,303,616	35,556,842
Other sorts . .	958	437,614	118	35,749	87	30,956
Total refined products	2,704,796	119,119,140	3,112,483	106,741,894	3,485,927	123,861,054
GRAND TOTAL .	5,082,103	193,639,012	4,658,726	146,916,580	4,660,155	154,923,115
	cwt.		*cwt.*		*cwt.*	
Paraffin wax . .	669,178	2,203,258	362,523	899,650	720,276	2,312,496
Mineral jelly . .	179,759	436,536	162,888	335,159	195,373	328,341
Carbon black from natural gas . .	867,190	3,596,749	562,447	1,981,810	874,815	2,700,120
Natural asphalt and bitumen . . .	*Tons* 54,653	552,611	*Tons* 49,765	487,757	*Tons* 44,630	448,879

Imports of crude petroleum into the United Kingdom during 1950 totalled 2,377,307,000 gallons, the highest for any year and 53.7 per cent above the total for 1949. However, the total import of refined products at 2,704,796,000 gallons was 13 per cent lower than the 1949 total. All products shared in the decreased import with the exception of lubricating oil, which showed an increase of 65 per cent, and "other sorts." The largest decrease was 25.9 per cent in the case of fuel and diesel oils, while gas oil imports declined by 19.2 per cent, kerosine by 10.6 per cent, and motor spirit by 9.0 per cent. Thus total imports of crude petroleum and liquid products in 1950 were 9.1 per cent higher than in 1949.

Details of petroleum imports for the past three years have been extracted from the official return* and are given in Table I. From this table it will also be noted that paraffin wax imports were nearly double the quantity for 1949, while there were also increases in the imports of mineral jelly, carbon black, and natural asphalt.

The importance of crude petroleum to the United Kingdom is illustrated in Table II, which shows that during the last four years the quantity imported has steadily increased from 17.8 to 46.8 per cent of the total petroleum import. Conversely, refined products have in general shown a decline in their percentages.

TABLE II
PERCENTAGE IMPORTS OF PETROLEUM INTO THE U.K.

	1950	1949	1948	1947
		Per cent		
Crude petroleum	46.8	33.2	25.2	17.8
Motor spirit	24.0	28.8	25.4	34.6
Other spirit	0.6	0.7	0.6	0.7
Kerosine	7.6	9.3	8.7	9.4
Lubricating oil	2.4	1.5	1.9	2.5
Gas oil	7.3	9.8	10.2	12.2
Fuel and diesel oils	11.3	16.7	28.0	22.8
	100.0	100.0	100.0	100.0

*"Accounts relating to trade and navigation of the United Kingdom, December, 1950." H.M.S.O., London, 6s. 6d. net.

C.I.F. Values

From the details given in Table I it will be noted that values of petroleum imported into the U.K. during 1950 were considerably higher than in 1949, even where the quantity imported showed a decrease. Thus, the amount paid for crude oil was 85.5 per cent higher, for all refined products, 11.6 per cent higher, and 31.8 per cent higher in the aggregate.

In Table III these values have been calculated on a unit basis and it will be seen that the value of all products rose sharply in 1950 in comparison with 1949. While increases in tanker rates and in world prices played their part in bringing about these increases, there can be little doubt that devaluation of the pound sterling was the largest factor involved.

TABLE III

AVERAGE C.I.F. UNIT VALUES OF U.K. PETROLEUM IMPORTS

	1950	1949	1948
	£ *Per* 1,000 *gal*		
Crude petroleum	31.35	25.98	26.45
Motor spirit	44.62	39.86	39.55
Other spirit	55.65	44.39	46.39
Kerosine	44.46	35.57	36.80
Lubricating oil	84.94	71.16	90.84
Gas oil	41.09	32.45	36.28
Fuel and diesel oils	25.89	21.15	27.28
Other sorts	456.80	302.96	355.80
Total refined products	44.04	34.30	35.53
	£ *per cwt.*		
Paraffin wax	3.29	2.48	3.21
Mineral jelly	2.43	2.06	1.68
Carbon black	4.15	3.52	3.09
	£ *per ton*		
Natural asphalt and bitumen	10.11	9.70	10.06

Excluding the oils classified as "other spirit" and "other sorts," which rose in unit value by 25.4 and 50.7 per cent respectively, the highest individual increase was 26.6 per cent for gas oil. The rises in cost of other refined products were: kerosine, 25 per cent; fuel and diesel oils, 22.4 per cent; lubricating oil, 19.4 per cent; motor spirit, 11.9 per cent; total refined products, 28.4 per cent. Crude oil rose in cash by 20.7 per cent.

Values of solid products also increased in 1950 and details are given in Table III.

TABLE IV

COUNTRIES CONSIGNING PETROLEUM TO THE U.K.

Country and Product	1950	1949	1948
	Thousand gallons		
BAHREIN, KUWAIT, QATAR, & TRUCIAL OMAN:			
Crude petroleum	938,019	531,883	156,934
Motor spirit	91,745	74,663	21,127
Kerosine	12,608	16,008	19,530
Gas oil	33,851	25,000	11,207
	1,076,223	647,554	208,498
BRITISH WEST INDIES:			
Motor spirit	67,063	68,866	88,266
Kerosine	40,267	44,251	45,848
Gas oil	16,597	18,083	25,330
Fuel and diesel oils	52,902	74,155	69,290
	176,829	205,355	228,734
OTHER COMMONWEALTH COUNTRIES & THE IRISH REPUBLIC:			
Crude petroleum	9,181	—	6,794
Motor spirit	—	51	73
Lubricating oil	19	50	79
Gas oil	201	4	2,864
Fuel and diesel oils	8,204	5,300	16,479
	17,605	5,405	26,289
PERSIA:			
Crude petroleum	607,636	333,161	246,761
Motor spirit	244,677	227,976	213,955
Kerosine	129,282	133,059	134,643
Gas oil	6,105	32,594	99,340
Fuel and diesel oils	273,178	384,282	426,213
	1,260,878	1,111,072	1,120,912
NETHERLANDS ANTILLES:			
Crude petroleum	278,589	219,839	278,653
Motor spirit	390,653	509,349	497,583
Kerosine	195,128	224,198	204,044
Lubricating oil	20,991	9,875	7,314
Gas oil	49,200	118,494	113,448
Fuel and diesel oils	76,332	186,408	722,273
	1,010,893	1,268,163	1,823,315
VENEZUELA:			
Crude petroleum	74,544	63,104	58,277
Motor spirit	204,983	48,809	17,196
Gas oil	102,997	50,183	13,767
Fuel and diesel oils	6	37,551	9,332
	382,530	199,647	98,572
NETHERLANDS:			
Motor spirit	95,374	41,720	—
Gas oil	40,648	11,924	3,052
Fuel and diesel oils	146,025	58,557	14,350
	282,047	112,201	17,402
SAUDI ARABIA:			
Crude petroleum	278,586	223,984	176,929
Motor spirit	1	9,099	5,080
Gas oil	—	20,137	7,956
	278,587	253,220	189,965

TABLE IV (*continued*)

UNITED STATES OF AMERICA:			
Crude petroleum	19,933	12,965	16,502
Motor spirit	77,601	296,697	283,419
Kerosine	7,297	5,700	1,929
Lubricating oil	95,038	62,680	78,982
Gas oil	39,565	93,786	157,536
Fuel and diesel oils	429	356	11,838
	239,863	472,184	550,206
IRAQ:			
Crude petroleum	127,203	122,603	192,568
FRANCE:			
Motor spirit	40,392	28,752	7,462
Gas oil	53,986	54,260	7,270
	94,378	83,012	14,732
PERU:			
Crude petroleum	37,920	37,124	39,932
MEXICO:			
Gas oil	26,355	28,542	33,046
INDONESIA*:			
Motor spirit	7,608	24,340	—
GERMANY:			
Gas oil	—	3,760	105
Fuel and diesel oils	5,629	14,266	397
	5,629	18,026	502
SOVIET UNION:			
Motor spirit	—	1,074	9,173
ROUMANIA:			
Motor spirit	—	—	21,626
ISRAEL:			
Motor spirit	—	—	13,414
OTHER FOREIGN COUNTRIES:			
Crude petroleum	5,696	1,580	1,178
Motor spirit	967	9,755	5,218
Kerosine	3,238	10,488	310
Lubricating oil	4,000	144	15
Gas oil	32	1,114	1,422
Fuel and diesel oils	12,355	15,367	33,444
	26,288	38,448	41,587

*Includes Netherlands New Guinea in 1948 and 1949.

Consigning Countries

Details which are available as to countries consigning petroleum to the U.K. are given in Table IV. These countries are not necessarily the country of origin of the shipment and are listed in their order of importance, with British Commonwealth countries first.

The Commonwealth is credited with about 23 per cent of the total import of petroleum into the U.K. in 1950. From Table IV it will be noted that by far the greater part of the Commonwealth import came from the Middle East group (Bahrein, Kuwait, Qatar, and Trucial Oman), with a diminishing portion from the British West Indies.

It should be noted that the order of importance of leading consigning countries changed considerably in 1950 in comparison with 1949. Thus, Persia took the lead from the Netherlands Antilles (formerly designated Netherlands West Indies), which dropped to third place just below the Bahrein group. A large increase in Venezuela's export to the U.K. brought her to fourth place from seventh in 1949, while the Netherlands rose from ninth to fifth. Saudi Arabia dropped from fifth to sixth place, the U.S.A. from fourth to seventh, and Iraq from eighth to ninth.

In Table V the U.K. imports of crude petroleum and refined products have been arranged by zones and this shows the increasing importance of the Middle East as the source of supply and the continued decline of imports from the Western Hemisphere. The increase in imports from Europe is almost wholly due to the amount imported from the

TABLE V

U.K. PETROLEUM IMPORTS BY ZONES OF CONSIGNMENT

	1950		1949		1948	
	1,000 *gal*	% *of total*	1,000 *gal*	% *of total*	1,000 *gal*	% *of total*
Middle East	2,742,891	54.0	2,134,449	45.8	1,725,357	37.0
Caribbean and Peru	1,608,172	31.7	1,710,289	36.7	2,190,553	47.0
Europe	382,054	7.5	214,313	4.6	63,435	1.4
U.S.A. and Mexico	266,218	5.2	500,726	10.8	583,252	12.5
Other and undisclosed areas	82,768	1.6	98,949	2.1	97,558	2.1

TABLE VI

U.K. RE-EXPORTS OF IMPORTED PETROLEUM

	1950	1949	1948
	Thousand gallons		
Motor spirit	12,083	13,897	12,896
Kerosine	3,394	3,766	2,103
Lubricating oil	2,085	1,542	1,637
Fuel and diesel oils	4,783	3,374	21,859
All other sorts	4,158	4,953	2,709
Total	26,503	29,532	41,204
Value	£1,352,638	£1,324,500	£1,678,372
	Thousand gallons		
Oil fuel shipped for use in steamers	525,895	479,492	468,048

Netherlands. In view of the increasing importance of crude petroleum to the U.K., it is of interest to record that 82 per cent of the import in 1950 came from the Middle East.

Re-Exports

As in 1949 the quantity of imported petroleum which was re-exported from the U.K. showed a decline, although value increased slightly. Details are given in Table VI, which also gives figures for bunker oil supplied to ships engaged in the foreign trade (including fishing vessels). This established a new high record.

Exports

Table VII shows that the exports of home-manufactured petroleum were much higher in 1950 than in the previous year, the quantitative increase being 168.9 per cent, with an increase of 85.8 per cent in the value. Comparative unit values in £ per 1000 gallons are: motor spirit, £47.47 (£38.85 *in* 1949); lubricating oil, £165.08 (£153.57); gas oil, £37.65 (£33.66); fuel and diesel oils, £24.13 (£22.31); all other sorts, £42.52 (£48.12).

TABLE VII

U.K. EXPORTS OF HOME-PRODUCED AND HOME-MANUFACTURED PETROLEUM

	1950		1949		1948	
	Quantity 1,000 *gal*	*Value* £	*Quantity* 1,000 *gal*	*Value* £	*Quantity* 1,000 *gal*	*Value* £
Motor spirit	29,368	1,394,074	16,113	626,028	6,182	286,754
Lubricating oil	30,925	5,105,136	30,076	4,619,013	27,956	4,526,451
Gas oil	19,389	729,921	8,928	300,587	4,244	153,640
Fuel and diesel oils	143,762	3,468,632	34,494	770,667	5,388	167,576
All other sorts	48,702	2,070,706	11,587	557,578	1,986	207,740
Total	272,146	12,768,469	101,198	6,873,873	45,756	5,342,161
	Cwt		*Cwt*		*Cwt*	
Lubricating compounds	233,305	742,510	163,745	496,424	131,997	435,446
Paraffin wax	55,799	155,610	33,070	122,375	53,093	208,794
	Tons		*Tons*		*Tons*	
Manufactured bituminous asphalt and emulsions	66,557	1,063,638	50,587	707,425	74,041	950,127

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Fuel Oil in Furnaces. The paper on "The use of fuel oil in furnaces for the iron and steel fabricating industries," by M. Roddan, originally presented at the 1948 Birmingham Conference on Modern Applications of Liquid Fuels, has been reprinted as a booklet. Copies from Fuel Oil Dept, Shell-Mex and B.P. Ltd, Shell-Mex House, London, W.C.2.

The Wakefield Oil Company head offices in Grosvenor Street will shortly be extending into the adjoining building vacated by the fashion house of Molyneux.

Kelloggram, No. 5, 1950, deals with new developments in alkylation. Copies from the M. W. Kellogg Co, Jersey City, N.J.

FORTHCOMING MEETINGS

INSTITUTE MEETINGS

A Symposium on Combustion Reactions in Relation to Gas Turbine Practice. At 26 Portland Place, London, W.1, 4 p.m. (*tea* 5.30 *p.m.*), May 9.

Fawley Branch

Distribution of Petroleum. C. H. Collins. At Esso Recreation Club, Holbury, Southampton, 7.30 p.m. April 18.

London Branch

Petroleum in Industry, V—Marine. Col. S. J. M. Auld. At 26 Portland Place, London, W.1, 6 p.m. (*tea* 5.30 *p.m.*), April 18.

Film, "Louisiana Story." Introduction by A. W. Deller, D.F.C. At Unilever House, E.C.4, 6 p.m., May 10.

Northern Branch

Alloyed Oils. R. D. Streeton and A. C. Mauchan. At Engineers' Club, Albert Square, Manchester, 6.30 p.m., April 17.

OTHER SOCIETIES

Recent Developments and Applications of Infra-Red Spectroscopy. H. W. Thompson. Chemical Society and Birmingham University Chemical Society. At Chemistry Dept., The University, Edgbaston, Birmingham, 4.30 p.m., May 11.

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U.K. T.E.L. EXPORTS

During 1950 the quantity of tetraethyl lead exported from the United Kingdom was 1,439,023 gallons, valued at £2,947,226 or £2 0s. 11½d. per gallon. The figures for 1949 were 1,360,890 gallons valued at £2,217,420 or £1 12s. 7d. per gallon, and for 1948, 1,346,738 gallons valued at £1,696,476 or £1 5s. 2d. per gallon.

"TINPLATE HANDBOOK"

A booklet of interest to buyers and users of tinplate has been written by W. E. Hoare. Sections deal with world production, manufacture, grading, testing, packing, ordering and applications.

A very useful feature is a glossary of tinplate terms in English, French, German and Spanish.

Copies of the handbook may be obtained free of charge from Tin Research Institute, Fraser Road, Greenford, Middlesex, England; Centre d'Information de l'Etain, 31 Rue du Marais, Brussels, Belgium; N. V. Billiton Maatschappij (Commerciële Dienst), Louis Couperusplein 19, The Hague, Holland; or Tin Research Institute, Inc., 492 West Sixth Avenue, Columbus, 1, Ohio, U.S.A.

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APPOINTMENTS VACANT

Anglo-American Oil Company Limited requires **Mechanical Engineers** for its new Refinery now under construction at Fawley, Southampton. Successful applicants will be required to act in the capacity of one of the posts listed below:

Mechanical General Foreman to supervise maintenance of all mechanical plant, responsible for planned maintenance of all multi-stage pumps etc., together with the operation of the Machine Shop. Candidate must have had at least five years of practical experience supervising similar work on heavy industrial plant on continuous process. The work will entail the direction of the activities of this department and the control of mechanical fitters working on the plants and in the workshops. Preference will be given to candidate with some Drawing Office experience.

A house for rental will be available at an early date if required by the successful candidate for this part.

Planning and Methods Engineer to be responsible for the production of programme to cover all plant maintenance and construction work, taking into account economic utilization of manpower and materials, and availability of maintenance equipment. Will also be required to operate

Cost Control Section and conduct work methods studies to increase work efficiency. Candidates should have a degree in Mechanical Engineering. Similar experience in heavy industry and some design or Drawing Office experience is desirable.

Assistant Supervisor of the Utilities Generation Division. Candidates should have a good honours degree in Engineering. Preference will be given to those with experience in steam generation and distribution and boiler feed water treatment.

Inspection Engineer for the Plant Inspection Department. The work involves the inspection of all refinery plant and equipment and study of corrosion and erosion problems and a knowledge of metallurgy would be an advantage. Candidates must have a Mechanical Engineering degree and at least two years' workshop training. Preference will be given to men who have had previous experience in the inspection of oil refining and/or heavy chemical plants.

The positions offered are pensionable. Applications should be forwarded to the Employee Relations Superintendent, Anglo-American Oil Company Ltd., Fawley, Southampton, stating age and details of qualifications and experience, together with present salary and salary expected.

Anglo-American Oil Co. Ltd., Refinery Dept., Fawley, Southampton, require **Chemists** and **Chemical Engineers** with good honours degrees and if possible with experience in the Petroleum or allied industries. Applications giving details of experience, qualifications, age and salary expected should be sent to the Employee Relations Superintendent at the above address.

Anglo-American Oil Company Ltd., Refinery Dept., Fawley, Southampton, have a vacancy in the Planning Section of the Technical Service Department at their new Refinery for a graduate in Chemistry and/or Mathematics. Work involves the planning and scheduling of operations for the process units. The post is pensionable. Applications giving details of age, qualifications, experience and salary required should be sent to the Employee Relations Superintendent at the above address.

Anglo-American Oil Co. Ltd. have vacancies for **Chemists** and **Chemical Engineers** in the following *supervisory posts* at their new Refinery at Fawley, near Southampton.

Candidates should have a good honours degree and preference will be given to those with petroleum experience. These posts are pensionable.

A. Assistant Chief Chemist. Candidates should have a good honours degree, experience of supervising a Laboratory with graduate and non-graduate staff engaged upon a quality control and plant research work related to the manufacturers of a wide range of petroleum products.

B. Process Engineer to take charge of Distillation Section Technical Service Dept. Candidates should preferably have experience of design and plant problem work on distillation units.

C. Process Engineer to take charge of Cracking Section Technical Service Dept. Candidates should preferably have experience of design and plant problem work on thermal and catalytic cracking units.

D. Process Engineer to take charge of Lubricating Oils Section Technical Service Dept. Candidates should preferably have design and plant problem experience on lubricating oil processing plant.

E. Process Engineer to take charge of Chemical Treating Section Technical Service Dept. Candidates should preferably have design and plant problem experience on chemical treating of hydrocarbons including soda washing, doctor treating and SO_2 extraction.

Applications, stating age, qualifications, experience and salary required, should be sent to the Employee Relations Superintendent, Anglo-American Oil Co. Ltd., Fawley, Southampton.

Required by major oil company for service in Venezuela **Transportation Engineer** of approximately 35 years of age. Married/single. Candidate must have completed automotive apprenticeship and had ten years' shop experience repair/overhaul of light/heavy mechanically propelled also earth moving and miscellaneous equipment internal combustion powered generally used in oilfield operations and construction, knowledge diesel engines. Also at least three years in oilfield transportation together with two years in an executive position. Must have executive/administrative ability and able to formulate operating/capital expenditure budgets, determine equipment standards, handle correspondence between fields and head office; also assist management establish transportation policies. Attractive salary for right man. Initial contract three years with three months paid leave U.K. Prospect advancement permanent career. Outfit allowance, all fares paid. Write giving full particulars to Box Z.Y., 814 Deacon's Advertising, 36 Leadenhall Street, E.C.3.

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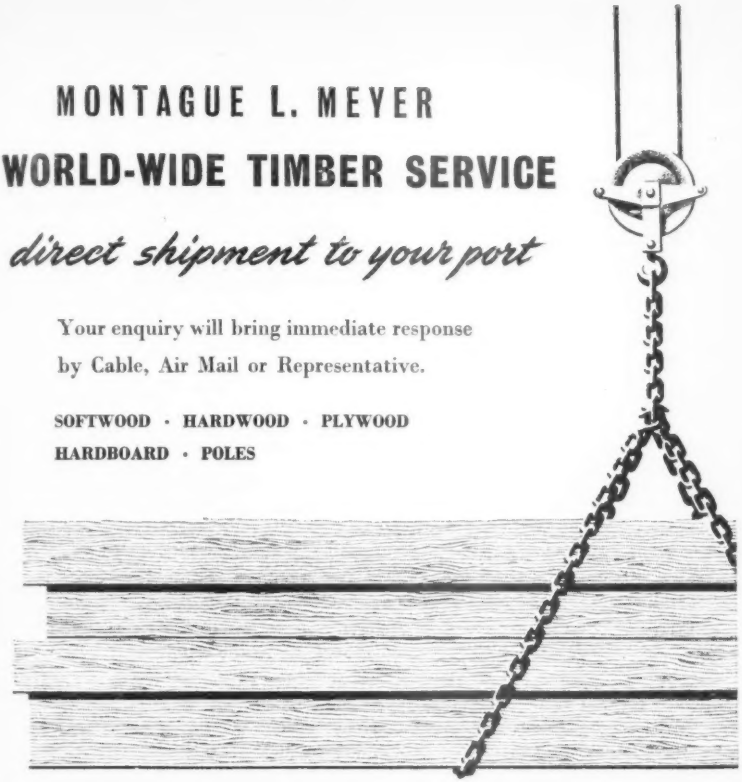

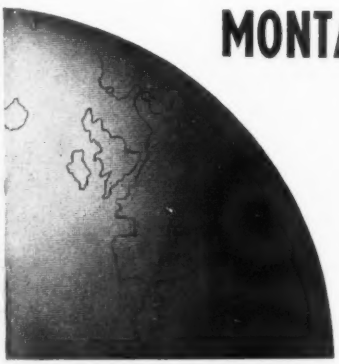

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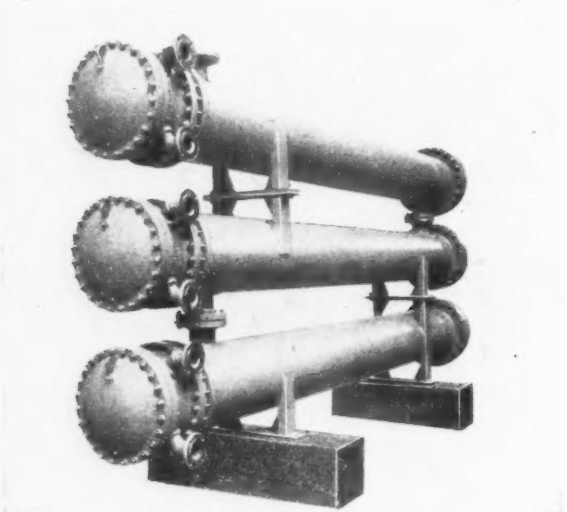

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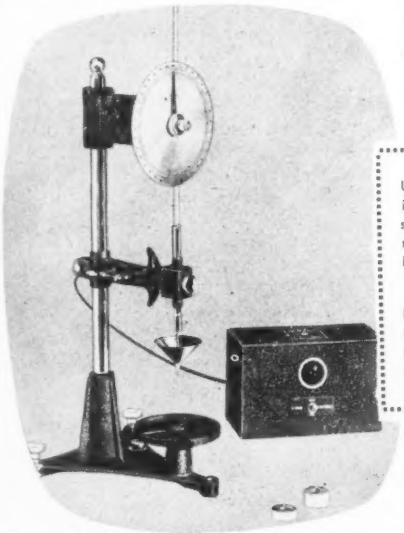

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